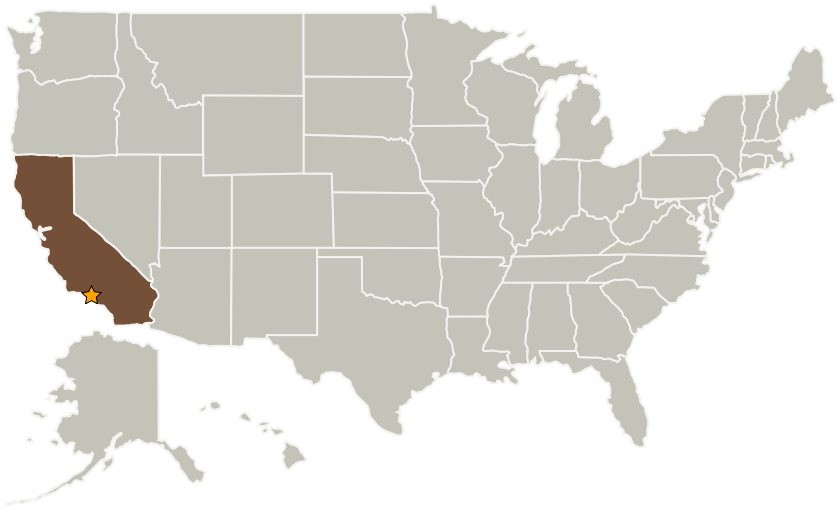
10^3 Segment MEMS Deformable-Mirror Process Development, Phase I

Completed Technology Project (2009 - 2009)

Project Introduction

Iris AO will extend its proven segmented MEMS deformable mirror architecture to large array sizes required for high-contrast astrophysical imagers. Current implementations consist of arrays of 37 mirror segments (currently available commercially) and 163 segment arrays (first prototypes under test). Existing thin-film based MEMS fabrication techniques used by competitors typically can not achieve an adequate degree of optical flatness and maintain it over a range of temperatures. Even newer thick-film methods suffer from the same problem to some degree. The Iris AO segmented mirror approach, on the other hand, uses a thick and rigid single-crystal-silicon optical surface bonded to an electrostatically driven actuator platform. This results in excellent mirror flatness and insensitivity to temperature even when specialized optical coatings are used. This proposal addresses scaling this technology up to 10^3 segments. Key technical issues to be addressed in accommodating the larger number of segments include: (a) controlling overall bow of the larger chip; (b) developing the electrical interconnect design and fabrication process, and (c) modifying the mirror-wafer bonding process. This Phase I will include one process run in order to test and refine the proposed solutions.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Iris AO, Inc.	Supporting Organization	Industry	Berkeley, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.2 Observatories
    - TX08.2.1 Mirror Systems